A Symbolic-Numeric Algorithm for Computing Approximate Solutions of First-order Formulae over the Reals.

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Traditionally, first-order formulae over the reals have been solved by purely symbolic methods, such as quantifier elimination by cylindrical algebraic decomposition. In the talk we will introduce a mixed symbolic-numeric algorithm that avoids the costly algebraic number computation of purely symbolic approaches. The algorithm assumes that each variable ranges over a predefined interval. It follows a branch and prune scheme in which branching splits the range of a variable into pieces, and pruning extracts useful information from the input formula while reducing the range of its variables. By relying on validated arithmetic the algorithm can still provide provably correct results, and terminates for those inputs that are numerically well-posed.